



## Science and Engineering Practice 7 – Engaging in Argument from Evidence

The study of science and engineering should produce a sense of the process of argument necessary for advancing and defending a new idea or an explanation of a phenomenon and the norms for conducting such arguments. In that spirit, students should argue for the explanations they construct, defend their interpretations of the associated data, and advocate for the designs they propose.

K – 2 Practices	3 – 5 Practices	6 – 8 Practices	9 – 12 Practices
<p>Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).</p> <ul style="list-style-type: none"> <li>• Identify arguments that are supported by evidence.</li> <li>• Distinguish between explanations that account for all gathered evidence and those that do not.</li> <li>• Analyze why some evidence is relevant to a scientific question and some is not.</li> <li>• Distinguish between opinions and evidence in one’s own explanations.</li> <li>• Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.</li> <li>• Construct an argument with evidence to support a claim.</li> <li>• Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.</li> </ul>	<p>Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none"> <li>• Compare and refine arguments based on an evaluation of the evidence presented.</li> <li>• Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.</li> <li>• Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.</li> <li>• Construct and/or support an argument with evidence, data, and/or a model.</li> <li>• Use data to evaluate claims about cause and effect.</li> <li>• Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem</li> </ul>	<p>Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).</p> <ul style="list-style-type: none"> <li>• Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.</li> <li>• Respectfully provide and receive critiques about one’s explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail.</li> <li>• Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.</li> <li>• Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.</li> <li>• Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.</li> </ul>	<p>Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.</p> <ul style="list-style-type: none"> <li>• Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues.</li> <li>• Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merits of arguments.</li> <li>• Respectfully provide and/or receive critiques on scientific arguments by probing reasoning and evidence, challenging ideas and conclusions, responding thoughtfully to diverse perspectives, and determining additional information required to resolve contradictions.</li> <li>• Construct, use, and/or present an oral and written argument or counter-arguments based on data and evidence.</li> <li>• Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence.</li> <li>• Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and/or logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations).</li> </ul>

Taken from Next Generation Science Standards - Appendix F: Practice 7 Engaging in Argument from Evidence (pg. 13-14).

<http://www.nextgenscience.org/sites/ngss/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf>